

1. **Family:** Pygopodidae
2. **Scientific Name:** *Aprasia aurita* Kluge, 1974
3. **English Name:** Mallee Worm-lizard

4. **Intraspecific taxa:** None
5. **Species survival status:** Endangered.
6. **Former distribution:** Recorded from the Woomelang and Ouyen area of north-western Victoria early this century; most of the land in the Ouyen and Woomelang area has now been alienated and cleared except for a few small remnants.
7. **Current distribution:** Wathe State Wildlife Reserve, north-western Victoria, appears to contain the last remaining population of this species. The reserve has a total area of about 6000 ha but the worm-lizard has only been recorded from four localities within a 400 ha portion of the reserve.
8. **Habitat:** Tall shrubland and open heath.

Appears to be restricted to mallee and heathy vegetation which has not been burnt for at least 40 years, growing on sandy soils. Individuals have been found in sand beneath mallee roots (Backhouse and Robertson, 1992).

9. **Reasons for decline:** Probably a combination of factors, including clearance of habitat for agriculture, crop production, fire regime involving too frequent burning of mallee. "Being confined to the one locality and in apparently low numbers would suggest that the species is vulnerable to catastrophes such as fire and disease" (Backhouse and Robertson, 1992). In November 1991 a wildfire burnt about 800 ha of Wathe SWR, including two of the four known *A. aurita* sites.

The Victorian DCNR Scientific Advisory Committee in 1991 determined that the species is in a demonstrable state of decline which is likely to result in extinction, and it is very rare in terms of abundance and distribution.

10. **Conservation reserves on which species occurs** (including a list of other Action Plan

species in each conservation reserve): Wathe State Wildlife Reserve (which is managed as a Fauna and Flora Reserve); the Malleefowl (listed as Vulnerable in The Action Plan for Australian Birds) also occurs there.

10A. **Other conservation reserves where species might be expected to occur:** Currently there is no evidence that the target species occurs, or is likely to occur, on any other reserves. Wyperfeld National Park (which is connected to Wathe SWR by a corridor of public land) contains vegetation communities similar to those occurring in Wathe, but it has a history of more frequent fires (Robertson *et al.*, 1989).

11. **Other public land on which species occurs:** Unknown; the 1-km wide corridor linking Wyperfeld NP and Wathe SWR is gazetted as State Forest but managed as a Flora and Fauna Reserve (Ian Sluiter, pers. comm.).

12. **Other land on which species occurs:** None known.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Further ground surveys need to be conducted to determine the full range of the species within Wathe SWR and adjacent land and to confirm its habitat preferences.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution to formulate appropriate management

- strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
- 15. Management actions already initiated:**
- 15.1: Listed on Schedule 1 of the Commonwealth's *Endangered Species Protection Act 1992* and listed as "threatened" on the 1993 Schedule 2 of the *Victorian Flora and Fauna Guarantee Act 1988*.
- 15.2: The species was recorded by Victorian Department of Conservation and Environment during a survey of the mallee area of north-western Victoria (Robertson *et al.*, 1989).
- 15.3: Action Statement for the species has been prepared by Victorian DCNR.
- 15.4: Section of the corridor between Wathe SWR and Wyperfeld NP which had been cleared, is being revegetated by the Victorian DCNR.
- 16. Management actions required:**
- 16.1: Survey known and potential habitat in Wathe Reserve; a survey in the spring of

- 1993 is planned by Victorian DCNR with funding from ANCA (Peter Robertson, pers. comm.).
- 16.2: Survey suitable habitat in Eastern Big Desert Land System and any other nearby reserves; (see above).
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species. Purchase private land adjacent to Wathe Reserve if it contains suitable habitat.
- 16.4: Develop and promote guidelines and provide incentives for landowners to protect remnant blocks of mallee vegetation on adjoining freehold land and to report any sightings of worm-lizards.
- 16.5: Continue to exclude fire from vicinity of Wathe Reserve and undertake study of fire regimes which promote continued survival of suitable habitat.

17. Organisations responsible for conservation of species and individuals involved: Victorian Department of Conservation and Natural Resources (Gary Backhouse, Peter Robertson, Ian Sluiter).

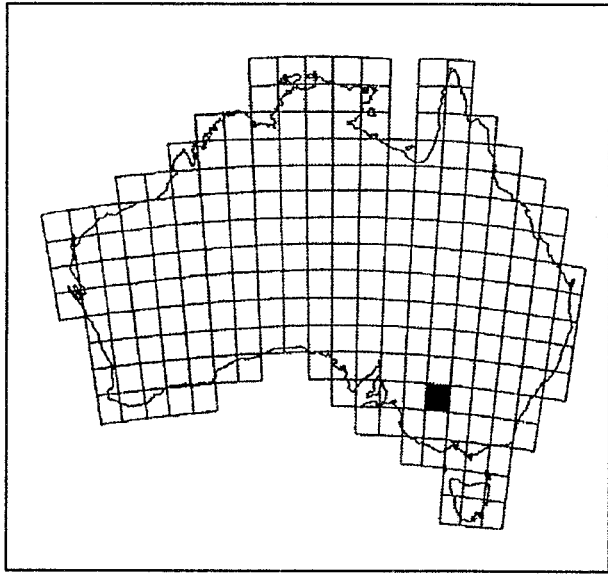
18. Other organisations and individuals involved: John Coventry (Museum of Victoria).

19. Can recovery plan be carried out with existing resources?:	No, but ANCA has funded a further survey to the value of \$15,000.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months per year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months per year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
4:	Purchase of land for the reserve system: uncosted.	
		Total \$92K

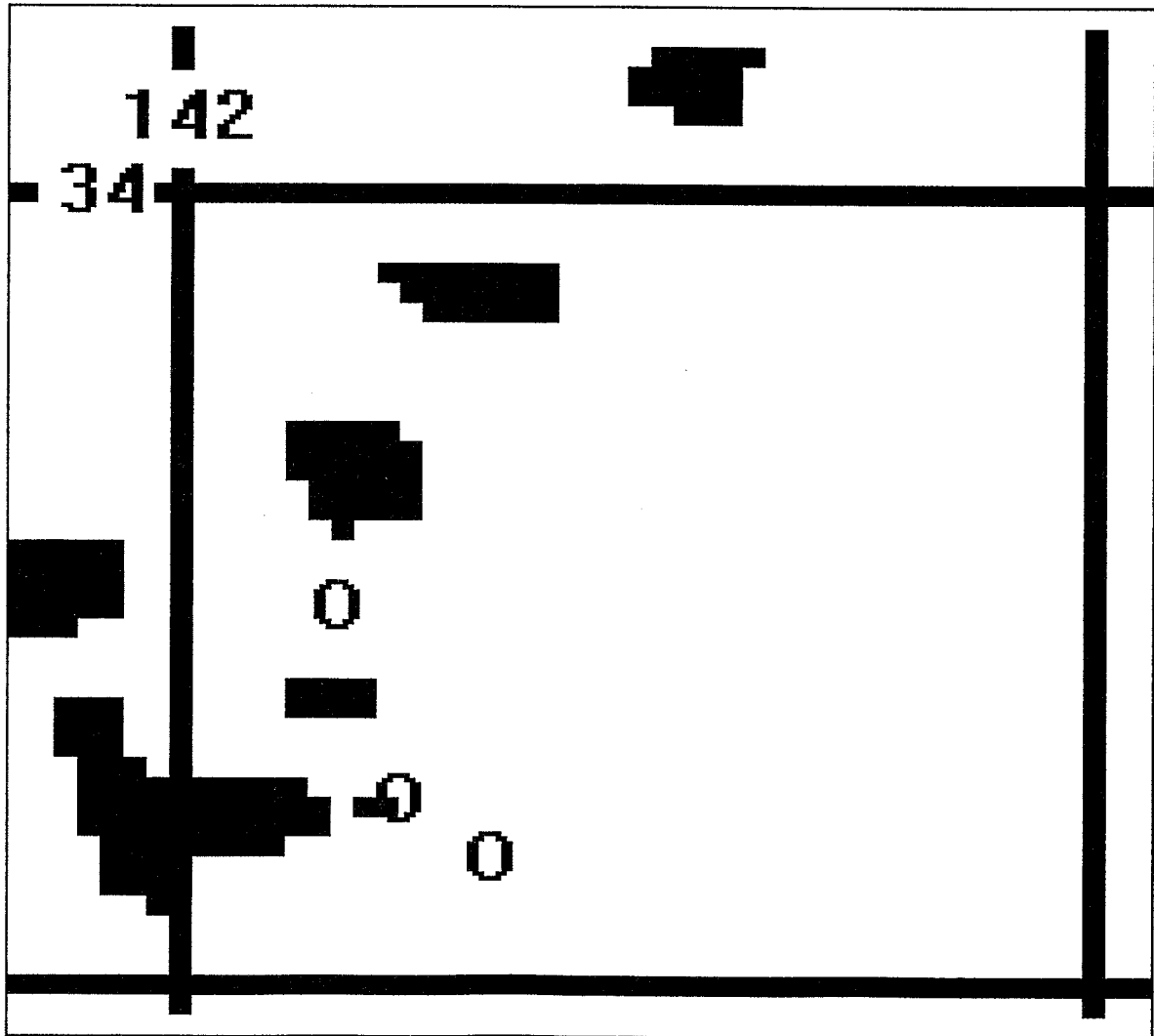
20. Remarks: 15 specimens documented in Australian museum collections. All recent records of the species relate to a single remnant population. Only about 15 individuals have been recorded since 1985; a juvenile taken in 1989 for electrophoretic analysis and four individuals were recorded as recently as September 1993 in the area that had been burnt in 1991.

References:

- Backhouse, G. and Robertson, P. 1992. Action Statement 20: Mallee Worm-Lizard *Aprasia aurita*. Victorian Department of Conservation and Environment, East Melbourne. 4 pp.
- Robertson, P., Bennett, A.F., Lumsden, L.F., Silveira, C.E., Johnson, P.G., Yen, A.L., Milledge, G.A., Lillywhite, P.K. and Pribble, H.J. 1989. Fauna of the mallee study area north-western Victoria. Arthur Rylah Institute Technical Report No. 87: 1-91.



Distribution of *Aprasia aurita*



1. **Family:** Pygopodidae
2. **Scientific Name:** *Aprasia pseudopulchella* Kluge, 1974
3. **English Name:** Flinders Ranges Worm-lizard

4. **Intraspecific taxa:** None, but "morphologically and electrophoretically this species is only doubtfully distinct from *Aprasia parapulchella* of NSW and Victoria" (Mark Hutchinson, *in litt.*).

5. **Species survival status:** Vulnerable.

6. **Former distribution:** Not known to have differed from current distribution.

7. **Current distribution:** Flinders Ranges south to the western slopes of northern and central Mount Lofty Ranges, South Australia and extending to the northern suburbs of Adelaide (Salisbury, Elizabeth).

8. **Habitat:** Open woodland, native tussock grassland, riparian habitats, rocky isolates.

Found under stones on clayey soils.

9. **Reasons for decline:** Probably a combination of factors, including clearance of habitat, overgrazing by stock, cropping, pasture improvement, urbanisation.

Most of the original vegetation occurring in the Mount Lofty Ranges has been destroyed by clearance and grazing sheep (Glenn Shea, pers. comm.).

10. **Conservation reserves on which species occurs** (including a list of other Action Plan species in each conservation reserve): Mount Remarkable NP; *Notechis ater* (Vulnerable) also occurs in Mount Remarkable NP.

10A. **Other conservation reserves where species might be expected to occur:** Black Rock CP, Clements Gap CP, Flinders Ranges NP, Gammon Ranges NP, Spring Gully CP, Telowie Gorge CP, Yalpara CP.

11. **Other public land on which species occurs:** Cobbler Creek RP, Salisbury East (Mitchell, 1993), Mambray Creek Reserve.

12. **Other land on which species occurs:** Private properties in the Burra and Mount Bryan areas, and in several outer north-western suburbs of Adelaide.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.

13.4: Genetic study needed to determine the taxonomic status of this taxon and its relationship to *Aprasia parapulchella*.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.

14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.

15. **Management actions already initiated:**

15.1: Allozyme study by Steve Donnellan and Mark Hutchinson (South Australian Museum).

16. **Management actions required:**

16.1: Survey known and potential habitat in

- reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines for landowners and users to reduce the impact of current land use practices on the species outside reserves.

16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: South Australian Department of Environment and Land Management.

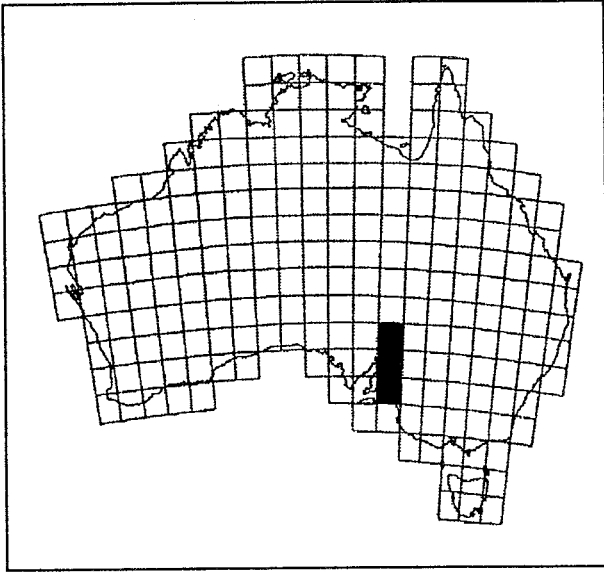
18. Other organisations and individuals involved: Mark Hutchinson and Steve Donnellan (South Australian Museum).

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months per year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
4:	Purchase of land for the reserve system: uncosted.	
		Total \$92K

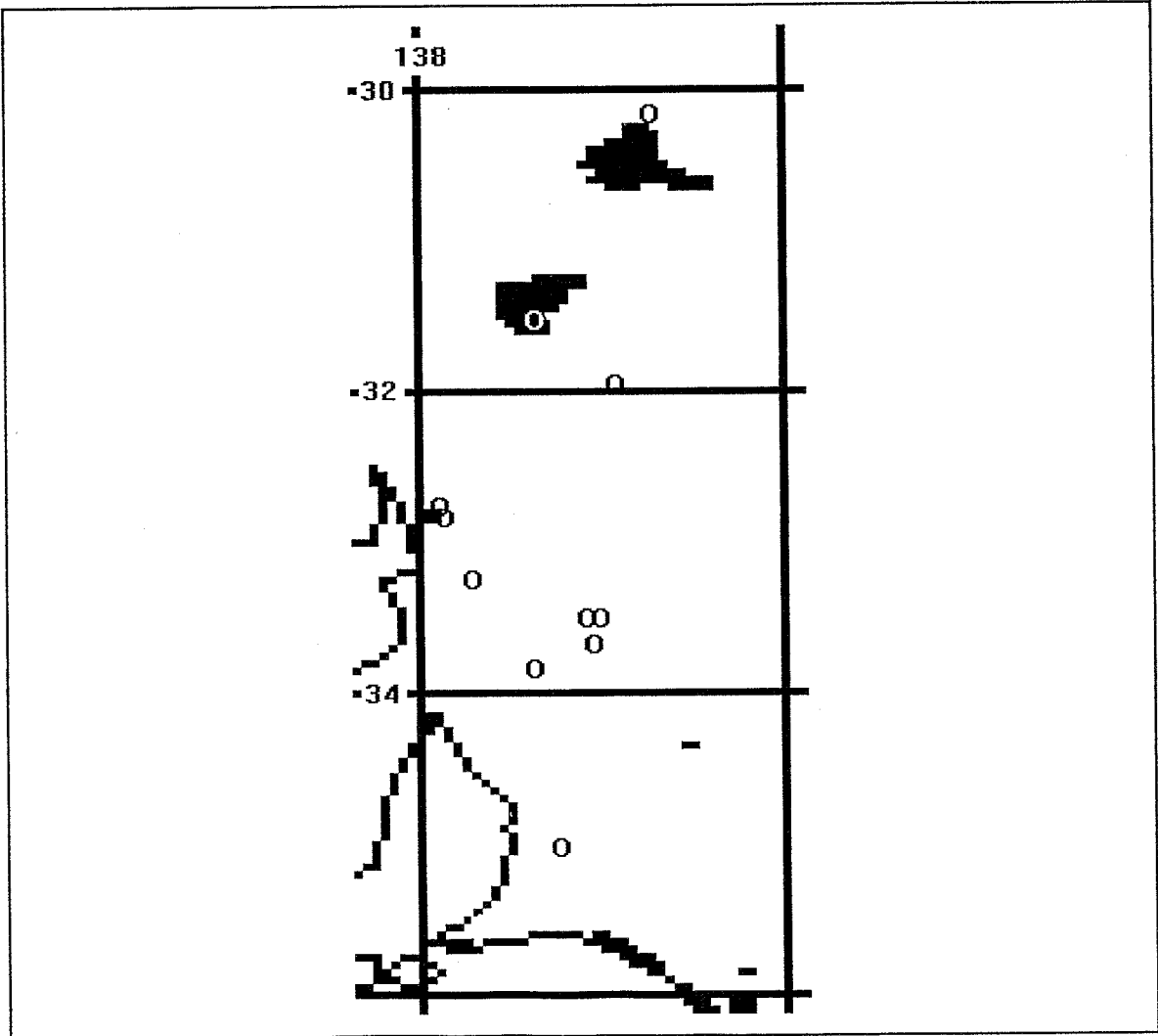
20. **Remarks:** 26 specimens documented in Australian museum collections. Mitchell (1993) recorded eight individuals over a period of 30 months during a survey of the herpetofauna of the Cobbler Creek Recreation Park.

References:

- Ehmann, H.F.W. 1992. Encyclopedia of Australian Animals: Reptiles. Australian Museum with Angus and Robertson, Sydney. xv + 495 pp.
- Mitchell, D.J. 1993. A survey of the reptiles of the Cobbler Creek Recreation Park, Salisbury Park, South Australia. Herpetofauna 22(2): 36-37.



Distribution of *Aprasia pseudopulchella*



1. Family:	Pygopodidae
2. Scientific Name:	<i>Aprasia rostrata rostrata</i> Parker, 1956
3. English Name:	Hermit Island Worm-lizard

4. **Intraspecific taxa:** *A. rostrata fusca* (Exmouth Gulf region, WA, but taxonomic status indeterminate (Glenn Shea, pers. comm.), *A. rostrata rostrata* (Montebello Island Group, WA).

5. **Subspecies survival status:** Vulnerable.

6. **Former distribution:** Not known to have differed from current distribution.

7. **Current distribution:** Known only from Hermit Island, Montebello Group, north-western Western Australia.

8. **Habitat:** Hummock grassland, rocky isolates.

Hermit Island is a rocky island derived from highly calcareous sandstone; *Triodia* hummock grassland is the dominant vegetation and low shrubs, tussock grasses and herbs grow in the gullies (Burbidge, 1971).

9. **Reasons for decline:** Not known to have declined, but its restriction to a single small island makes it very vulnerable to threatening processes which include human disturbance and predation by cats and rats (*Rattus rattus*).

In the 1950s there was considerable human activity on the island associated with the testing of nuclear weapons by the British Atomic Weapons Research Establishment. Hill (1955) reported the presence of cats which had apparently exterminated the two marsupials recorded on the island in 1914 (Montague in Hill, 1955) and cats are known predators of other species of *Aprasia* (Brooker, 1978).

10. **Conservation reserves on which subspecies occurs:** None.

10A. **Other conservation reserves where subspecies might be expected to occur:** None.

11. **Other public land on which subspecies occurs:** Hermit Island, Montebello Group;

currently Commonwealth land but in the process of being transferred to State control.

12. **Other land on which subspecies occurs:** None.

13. **Is knowledge about subspecies adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to confirm its continued survival and to determine its habitat preferences and the extent of its occurrence on Hermit Island.

13.2: Research is needed into the basic biology and ecology of the subspecies in the field; it should include long term monitoring of changes in population size and habitat use.

13.3: Research is needed to determine if the subspecies is declining and if so, to identify the major factors contributing to that decline.

13.4: Genetic study needed to determine the taxonomic status of this population and its relationship to *Aprasia rostrata fusca*.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the subspecies' biology and ecology to determine its current conservation status and formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the subspecies are maintained within a reserve system.

15. **Management actions already initiated:**

15.1: Burbidge (1971) recommended Hermit Island be made an 'A' class reserve for the "Conservation of Fauna and Flora" and that it be vested in the Western Australian Wildlife Authority (now CALM).

15.2: Montebello Islands in process of being transferred to State control, following which they will be declared a national

park and marine park reserve.

16. Management actions required:

- 16.1: Survey Hermite Island for this species.
- 16.2: Establish reserve on the island.
- 16.3: Implement control program for cats (and rats) if they still occur on the island.

17. Organisations responsible for conservation of subspecies and individuals involved: Western Australian Department of Conservation and Land Management (Andrew Burbidge, Peter Kendrick).

18. Other organisations and individuals involved: None known.

19. Can recovery plan be carried out with existing resources?: No.
1: Survey of habitat preferences and occurrence on Hermite Island: 2 workers for 1 month per year for 2 years - \$13,333 salary; \$10,000 expenses (1.5 x standard expenses for remote region). \$23.333K
2: Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 2 months per year for 2 years - \$13,333 salary; \$10,000 expenses (1.5 x standard expenses for remote region). \$23.333K
3: Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
Total \$58.7K

20. Remarks: Only two museum specimens known. Collected on a single occasion, in 1952; not recorded by Montague in 1914 (Hill, 1955) or in 1970 by Burbidge (1971).

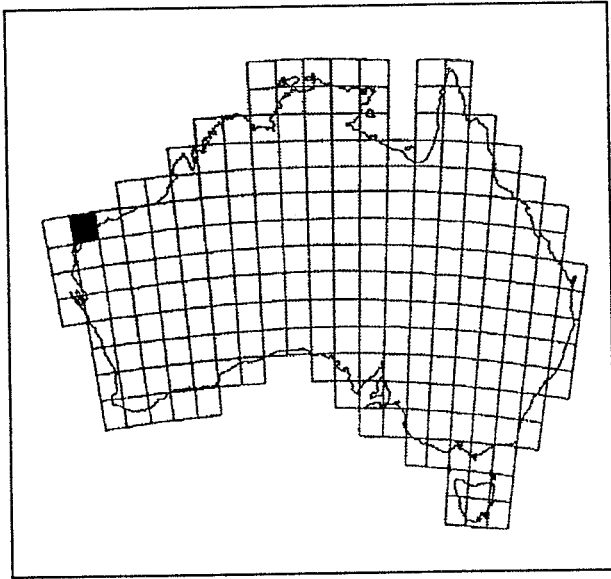
References:

Brooker, M.G. 1978. Some notes on the mammalian fauna of the western Nullarbor Plain. *Western Australian Naturalist* 14(1): 2-15.

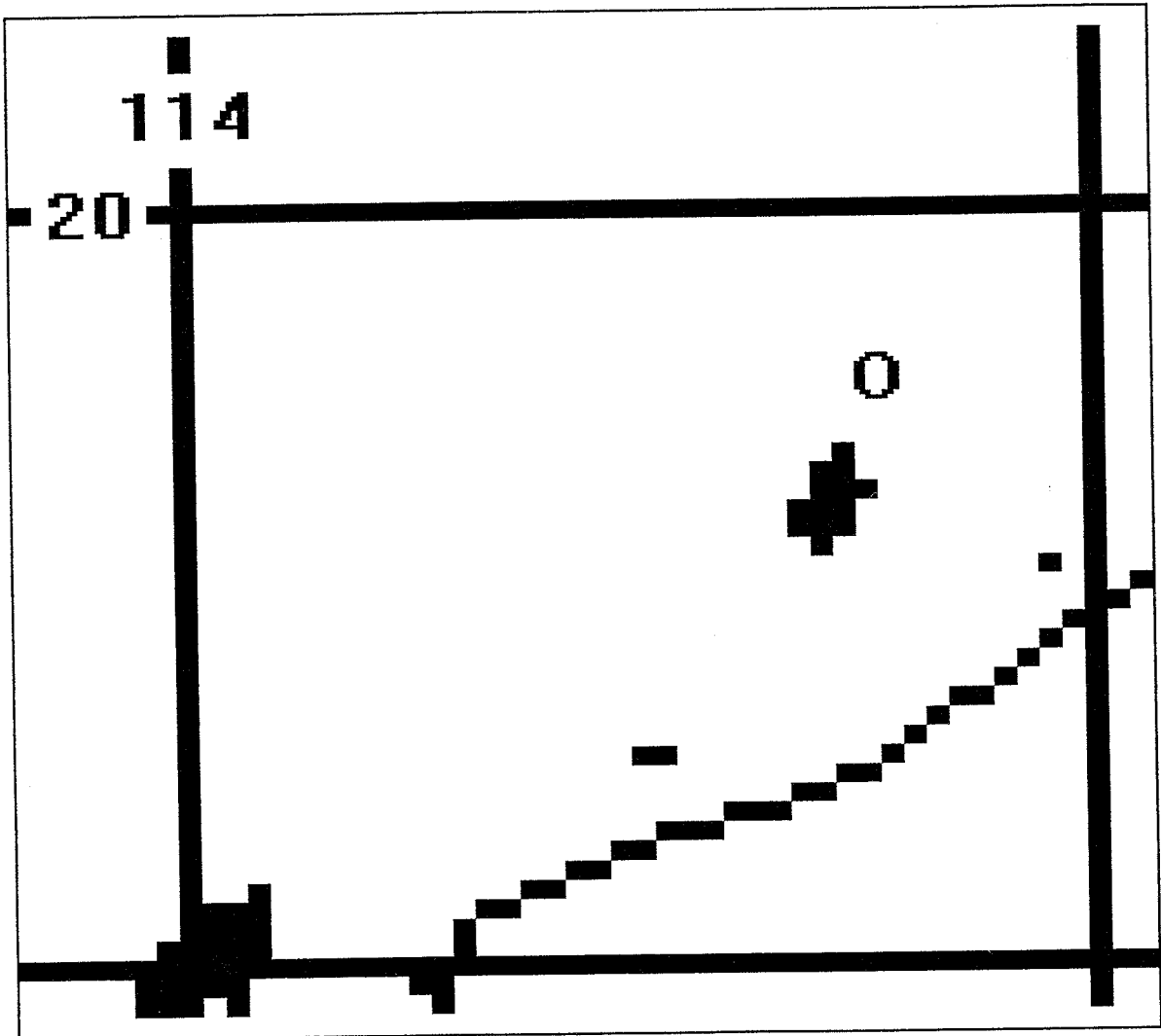
Burbidge, A.A. 1971. The fauna and flora of the Monte Bello Islands. Western Australia Department of Fisheries and Fauna Report 9: 1-15.

Hill, F.L. 1955. Notes on the natural history of the Monte Bello Islands. *Proceedings of the Linnean Society of London* 165(2): 113-124.

Kluge, A.G. 1974. A taxonomic revision of the lizard family Pygopodidae. *Miscellaneous Publications of the Museum of Zoology, University of Michigan* 147: i-vi + 1-221.



Distribution of
Aprasia rostrata rostrata



1. Family:	Pygopodidae
2. Scientific Name:	<i>Delma impar</i> Fischer, 1882
3. English Name:	Striped Legless Lizard

4. **Intraspecific taxa:** None

5. **Species survival status:** Vulnerable.

6. **Former distribution:** The Australian Capital Territory, south-west slopes and Southern Tableland of New South Wales, central and southern Victoria and extreme south-eastern corner of South Australia.

7. **Current distribution:** In the ACT found in only three localities around Canberra (Williams and Kukolic, 1991); in New South Wales, the only recent records are from Batlow (1977), and Goulburn in 1992 (Grant Husband, in prep.). The range in Victoria appears to have contracted to the southern part of the state, with concentrations in the outer western and northern suburbs of Melbourne and in the Western District of the state. No longer found in the inner metropolitan areas of Melbourne. May no longer occur in South Australia (the most recent specimens were collected in 1969 and the area now appears unlikely to support a population) (Coulson, 1990).

8. **Habitat:** Tussock grassland.

Preferred habitat appears to be dense, relatively undisturbed lowland native grassland dominated by perennial *Stipa* and *Themeda* species; typically the grasslands occur on flat or gently undulating plains (Coulson, 1990; Kukolic and Osborne, 1992). In Victoria, microhabitat usually includes a moderate cover or mat of native or introduced grasses together with basalt rocks on the surface or embedded in the soil (usually a cracking clay derived from basalt).

9. **Reasons for decline:** Probably a combination of factors, including clearance of habitat for agriculture and grazing, prolonged heavy grazing by stock, pasture improvement, crop production, urban development, rock removal, inappropriate fire regimes, habitat fragmentation and weed invasion.

In the Melbourne metropolitan area and the ACT, a large proportion of the suitable known habitat has been lost to, or is threatened by, urbanisation (for example, massive road works and new suburb development) (Richard Longmore, pers. comm.). Cool fires in grassland reserves have caused mortality (Coulson, 1990).

In rural areas the suitable grasslands have been extensively modified by grazing, cropping and the introduction of non-native pasture species. The survival of populations of *Delma impar* varies with the intensity of agricultural and grazing practices - they appear to be able to survive light grazing but have disappeared following continual heavy grazing or cultivation. Large-scale removal of rocks for landscape gardening may contribute to their decline (Robertson *et al.*, 1989; Coulson, 1990).

10. **Conservation reserves on which species occurs:** Australian Capital Territory: does not occur in any existing or proposed reserve (Kukolic and Osborne, 1992).

Victoria: Derrimut Grasslands Reserve.

South Australia: Bool Lagoon Game Reserve (last recorded in 1969).

10A. **Other conservation reserves where species might be expected to occur:**

Australian Capital Territory: None.

New South Wales: Avisford NR, Conimbla NP, Copperhanna NR, Curumbenya NR, Dananbilla NR, Kosciusko NP, Nangar NP, Tarlo River NP.

Victoria: most Victorian reserves in the vicinity of *impar* records have little or no suitable habitat.

South Australia: Big Heath CP, Fairview CP.

11. **Other public land on which species occurs:**

Australian Capital Territory: Gungahlin (CSIRO Divn of Wildlife and Ecology research station and leased paddocks, Telecom transmission site and site of proposed urban development of Gungahlin township); Majura Valley (Civil Aviation Authority); National Museum of Australia site;

Victoria: Defence Dept Albion Explosives

Factory, Australian Army Rockbank Receiving Station; roadside reserves near Hamilton, Creswick, Caramut and Rokewood (Coulson, 1990).

12. Other land on which species occurs:

New South Wales: at least one private property on the outskirts of Goulburn (Grant Husband, pers. comm.).

Victoria: a number of private properties between Melbourne and the South Australian border, including the districts of Deer Park, Derrimut, Colac, Cressy and Ballarat.

13. Is knowledge about species adequate for objectives and actions to be defined accurately?:
Generally yes for habitat requirements.

13.1: Ground surveys are required in southern New South Wales and in south-eastern South Australia, to determine its full geographic range and the extent of its occurrence in existing reserves.

13.2: Further research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.

14. Recovery Plan objectives:

14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status in all states and territories within its geographic range, and to formulate appropriate management strategies.

14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.

14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.

15. Management actions already initiated:

15.1: Listed on Schedule 1 of the Commonwealth's *Endangered Species Protection Act 1992*, listed as "vulnerable and rare" in 1992 Revised (Interim) Schedule 12 of the *NSW Endangered Fauna (Interim Protection) Act 1991*, as "special protection status" in the 1991 Section 6 Schedule of the *ACT Nature*

Conservation Act 1980 and as "threatened" on the 1993 Schedule 2 of the *Victorian Flora and Fauna Guarantee Act 1988*.

Australian Capital Territory:

15.2: Survey of 56 sites in the ACT by the ACT Parks and Conservation Service. Further distributional survey funded by ESU as part of the ACT Grasslands Recovery Program is now under way.

15.3: Identification by the ACT Parks and Conservation Service (Wildlife Research Unit, 1991 and 1992) of a range of management actions.

Victoria:

15.4: Preparation of Management Plan for Derrimut Grasslands Reserve.

15.5: Preparation of Flora and Fauna Guarantee Action Statement.

15.6: Establishment of Striped Legless Lizard Working Group.

15.7: Initial study of distribution and ecological requirements conducted for the Dept of Conservation and Natural Resources.

15.8: Initiation of public awareness campaign.

15.9: Development of contingency plan to relocate individuals threatened by construction of housing estates.

15.10: Establishment of small captive colony at Melbourne Zoo.

15.11: Grants offered to postgraduate students to conduct research on the species.

16. Management actions required:

16.1: In south-eastern New South Wales and the Bool Lagoon area of South Australia, survey known and potential habitat in reserves.

16.2: In Victoria, near Melbourne, conduct ground survey of potentially suitable grasslands in areas close to Derrimut Reserve and along the Werribee and Plenty Growth Corridors; in central, western and north-eastern Victoria, utilise local news media and conservation groups to conduct indirect survey of grasslands outside reserves.

16.3: Establish appropriate reserves (including *Themeda* and *Stipa* grasslands at Gungahlin, ACT) if the existing reserve system is found to be inadequate to secure the survival of the species throughout its range.

16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current

- land use practices on the species outside reserves.
- 16.5: Continue and expand programs for community awareness within the species' known range.
- 16.6: Encourage captive breeding program for re-introduction of the species into reserves within its known range.

Most of these actions recommended by Coulson (1990) and adopted in the Victorian Action Statement (Webster *et al.*, 1992).

17. Organisations responsible for conservation of species and individuals involved:

Australian Capital Territory Parks and

Conservation Service (Kruno Kukolic, Will Osborne); New South Wales National Parks and Wildlife Service; Victorian Department of Conservation and Natural Resources (Peter Robertson, Alan Webster, Rob Humphries); South Australian Department of Environment and Land Management.

18. Other organisations and individuals involved:

Graeme Coulson (University of Melbourne); John Coventry (Museum of Victoria); Chris Banks (Melbourne Zoo); Alex Kutt (Biosis Research).

19. Can recovery plan be carried out with existing resources?:		No, although some responsible agencies are already directing some of their resources into recovery activities; for example, VDCNR's resource costing estimates over 10 year period are \$121,000 (Alan Webster, <i>in litt.</i>).
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 4 months each year for 2 years - \$53,333 salary; \$26,667 expenses.	\$80K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 6 months each year for 2 years - \$40,000 salary; \$20,000 expenses.	\$60K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
4:	Establishment of captive breeding program: 1 worker for 2 months each year for 2 years - \$13,333 salary; \$2,667 expenses.	\$16K
5:	Purchase of land for the reserve system: uncosted.	
		Total \$168K

20. Remarks: 89 specimens documented in Australian museum collections. 405 individuals recorded in survey of 56 sites in the ACT between 1990 and 1992 (Kukolic, in prep.). 124 specimen and observation records in the Atlas of Victorian Wildlife in 1991 (Peter Robertson, pers. comm.).

References:

ACT Parks and Conservation Service Wildlife Research Unit. 1991. Lowland native grassland communities in the Australian Capital Territory and region: a recovery plan. Unpublished report to the ANPWS Endangered Species Unit.

ACT Parks and Conservation Service Wildlife Research Unit. 1992. Recovery Plan. Lowland native grassland ecosystems in the Australian Capital Territory. Progress report to the ANPWS Endangered Species Unit.

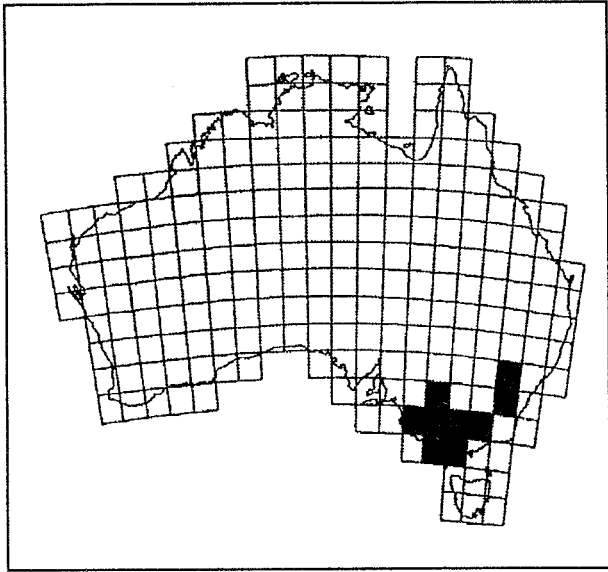
Coulson, G. 1990. Conservation biology of the Striped Legless Lizard (*Delma impar*); an initial investigation. Arthur Rylah Institute for Environmental Research Technical Report Series 106: i-viii + 1-40.

Kukolic, K. and Osborne, W.S. 1992. *Delma impar* (Striped Legless Lizard). pp. 23-27 in Recovery Plan: lowland native grassland ecosystems in the Australian Capital Territory. Unpublished progress report to the Australian National Parks and Wildlife Service Endangered Species Unit. Wildlife Research Unit, ACT Parks & Conservation Service.

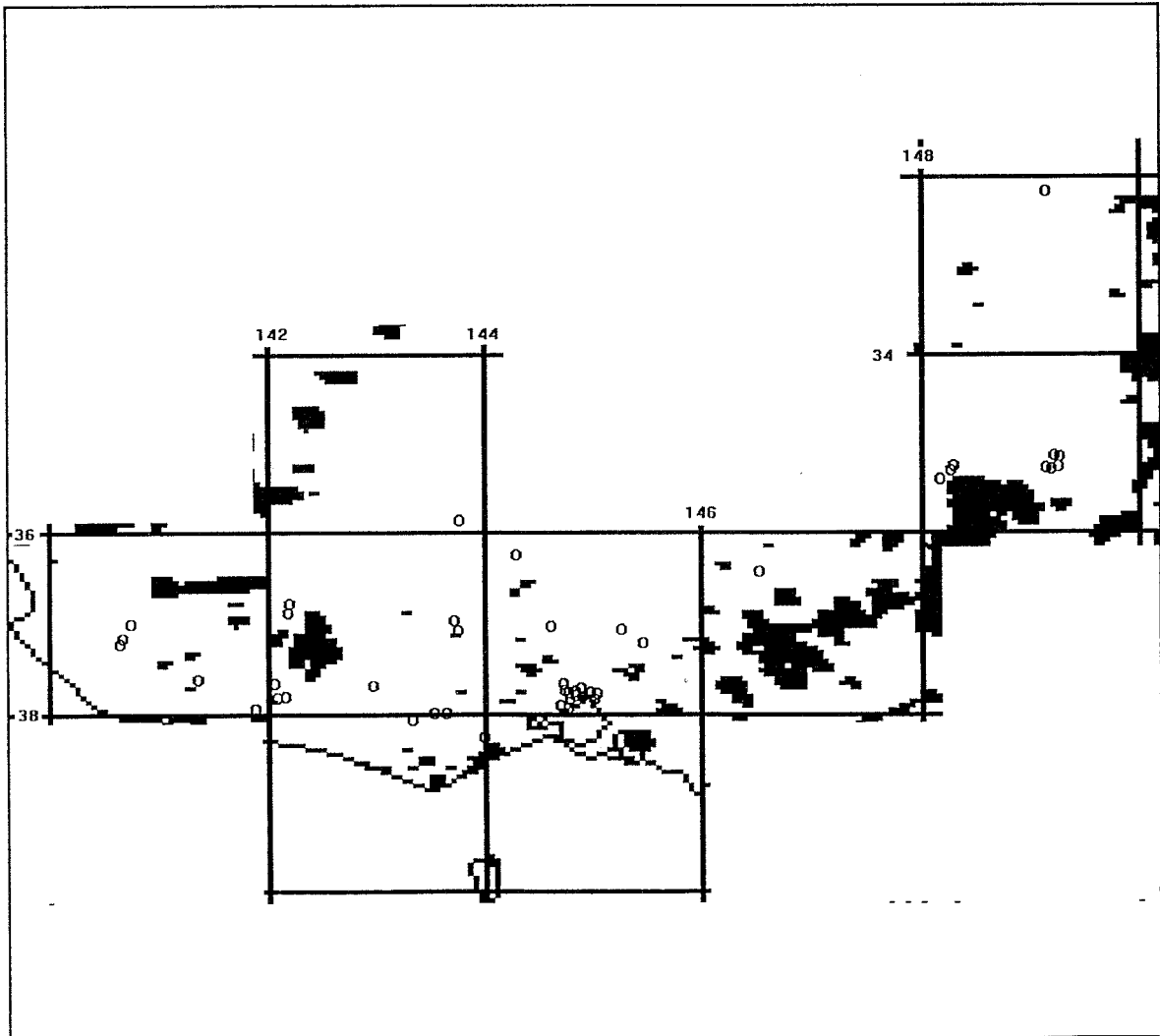
Robertson, P., Bennett, A.F., Lumsden, L.F., Silveira, C.E., Johnson, P.G., Yen, A.L., Milledge, G.A., Lillywhite, P.K. and Pribble, H.J. 1989. Fauna of the mallee study area north-western Victoria. Arthur Rylah Institute Technical Report No. 87: 1-91.

Webster, A., Fallu, R. and Preece, K. 1992. Action Statement 17: Striped Legless Lizard, *Delma impar*. Victorian Department of Conservation and Environment, East Melbourne. 8 pp.

Williams, K. and Kukolic, K. 1991. Fauna of the ACT's native grasslands. pp. 11-19 in R. Falconer (ed.) The ACT's Native Grasslands. Proceedings of a workshop. Conservation Council of the South-east Region and Canberra.



Distribution of *Delma impar*



1. **Family:** Pygopodidae
2. **Scientific Name:** *Delma labialis* Shea, 1987
3. **English Name:** Striped-tailed Delma

4. **Intraspecific taxa:** None
5. **Species survival status:** Vulnerable.
6. **Former distribution:** Not known to have differed from current distribution.
7. **Current distribution:** Magnetic Island north of Townsville, north Queensland and a few localities on the mainland near Townsville.
8. **Habitat:** Tall open forest, open forest, open woodland.

Holotype from north of Townsville found in low open forest with a grassy understorey; on Magnetic Island found in wet sclerophyll forest and open woodland in sites close to the beach. One individual found in litter and another under sheets of iron; two were active during the day.
9. **Reasons for decline:** Probably a combination of factors, including overgrazing by stock, clearance of habitat for agriculture and urbanisation, disturbance by frequent visitation. Magnetic Island is a popular tourist destination and "clearing for real estate and farming" (Keith McDonald, *in litt.*) is likely to threaten the population of *Delma labialis* there and on the mainland.
10. **Conservation reserves on which species occurs:** Townsville Town Common Environmental Park, Magnetic Island National Park.
- 10A. **Other conservation reserves where species might be expected to occur:** Bowling Green Bay NP, Cape Upstart NP, Mount Spec/Crystal Creek NP.
11. **Other public land on which species occurs:** None known.
12. **Other land on which species occurs:** Potentially present in suitable habitat on private properties on Magnetic Island and in the vicinity of Townsville.
13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.
 - 13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.
 - 13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
 - 13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.
14. **Recovery Plan objectives:**
 - 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
 - 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
 - 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
15. **Management actions already initiated:**
 - 15.1: Listed on Schedule 1 of the Commonwealth's *Endangered Species Protection Act 1992*.
16. **Management actions required:**
 - 16.1: Survey known and potential habitat in reserves within the species' known range.
 - 16.2: Survey known habitat outside reserves within the species' known range.
 - 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
 - 16.4: Develop and promote guidelines and

provide incentives for landowners and tourism operators to reduce the impact of current land use practices on the species outside reserves.

- 16.5: Develop community awareness within the species' known range.

17. Organisations responsible for conservation of species and individuals involved: Queensland Department of Environment and Heritage (Keith McDonald).

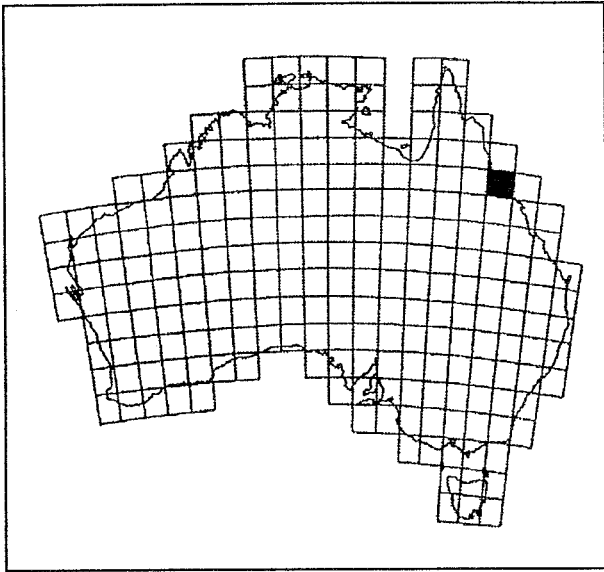
18. Other organisations and individuals involved: Glenn Shea (University of Sydney).

19. Can recovery plan be carried out with existing resources?:	Nb.
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses. \$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 2 years - \$26,667 salary; \$13,333 expenses. \$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
	Total \$92K

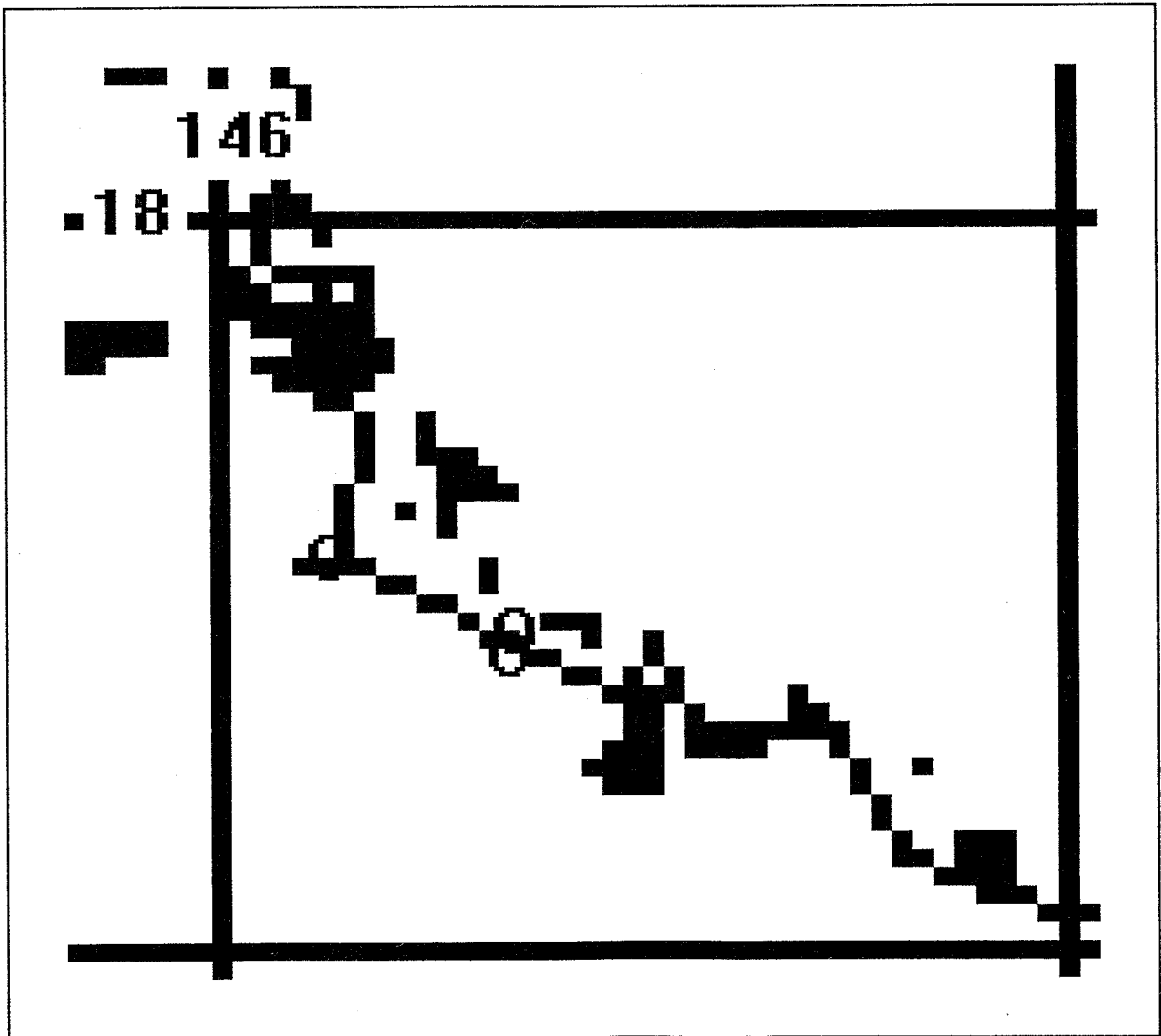
20. Remarks: Eight specimens documented in Australian museum collections; 4 additional individuals have been photographed and/or observed in the field (Shea, 1987).

References:

- Low, T. 1978. The reptiles of Magnetic Island, nth Queensland. *Herpetofauna* 9(2): 10-14.
- McDonald, K.R., Covacevich, J.A., Ingram, G.J. and Couper, P.J. 1991. The status of frogs and reptiles. pp. 338-345 in G.J. Ingram and R.J. Raven (eds) *An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals*. Queensland Museum, Brisbane.
- Shea, G.M. 1987. Two new species of *Delma* (Lacertilia: Pygopodidae) from north-eastern Queensland and a note on the status of the genus *Aclys*. *Proceedings of the Linnean Society of NSW* 109(3): 203-212.



Distribution of *Delma labialis*



1. Family:	Pygopodidae
2. Scientific Name:	<i>Delma torquata</i> Kluge, 1974
3. English Name:	Collared Delma

4. **Intraspecific taxa:** None
5. **Species survival status:** Vulnerable.
6. **Former distribution:** "south-eastern Queensland, from Ulam [near Rockhampton] in the north to Kenmore in the south" (Kluge, 1974); the Ulam record may have represented an isolated population some distance north of the range of the main population (Glenn Shea, pers. comm.).
7. **Current distribution:** Based on recent museum records, northern limit of range may have contracted to Gympie; in the Brisbane region, restricted to the outer western suburbs.
8. **Habitat:** Open woodland.
- Found on rocky hillsides on basalt and lateritic soils supporting scattered eucalypts and shrubs with a grassy understorey; also reported from eucalypt woodland adjacent to semi-evergreen vine thicket (Wilson and Knowles, 1988).
9. **Reasons for decline:** Probably a combination of factors, including overgrazing by stock, clearance of habitat for agriculture and grazing, pasture improvement and urban development.
- This species has a restricted distribution in an area of high human impact; much of its habitat has been lost to land clearance for pastoralism and urbanisation (McDonald et al, 1991). The holotype was collected on the "spur of a small grassy hill where cattle had been grazing. Most of the trees (gums) had been dozed over and heaped" (Low, *in Kluge*, 1974).
10. **Conservation reserves on which species occurs:** Crows Nest NP, Bunya Mountains NP. There is little habitat suitable for the species within these parks and it is not known if it still occurs there (Rob Porter, *in litt.*).
- 10A. **Other conservation reserves where**
- species might be expected to occur: Conondale NP.
11. **Other public land on which species occurs:** Brisbane City Council water catchment reserve in the vicinity of Mount Crosby.
12. **Other land on which species occurs:** Private properties within the suburbs of Mount Crosby and Karana Downs; potentially present in suitable habitat on private properties throughout the species' range.
13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.
- 13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.
- 13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
- 13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.
14. **Recovery Plan objectives:**
- 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
15. **Management actions already initiated:**
- 15.1: Listed on Schedule 1 of the

- Commonwealth's *Endangered Species Protection Act 1992*.
- 15.2: Recovery plan prepared by QDEH.
- 15.3: Field study of population at Mount Crosby commenced by Lone Pine Koala Sanctuary, which proposes to undertake a captive breeding program after it has developed suitable techniques using two analogous species
- 15.4: The Sanctuary has also initiated a community media program to promote public awareness of the species and it is hoped, to lead to the identification of other locations where it occurs.
- 16. Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be

- inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines for landowners and users to reduce the impact of current land use practices on the species outside reserves.
- 16.5: Continue to develop community awareness within the species' known range.
- 16.6: Encourage captive breeding program for re-introduction of the species into reserves within its known range.

17. Organisations responsible for conservation of species and individuals involved: Queensland Department of Environment and Heritage.

18. Other organisations and individuals involved: Rob Porter (Lone Pine Koala Sanctuary).

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
4:	Establishment of captive breeding program: 1 worker for 2 months each year for 2 years - \$13,333 salary; \$2,667 expenses.	\$16K
		Total \$108K

20. Remarks: 14 specimens documented in Australian museum collections. Up to 10 individuals are being found on each visit to the Mount Crosby area by the Lone Pine staff (Rob Porter, *in litt.*).

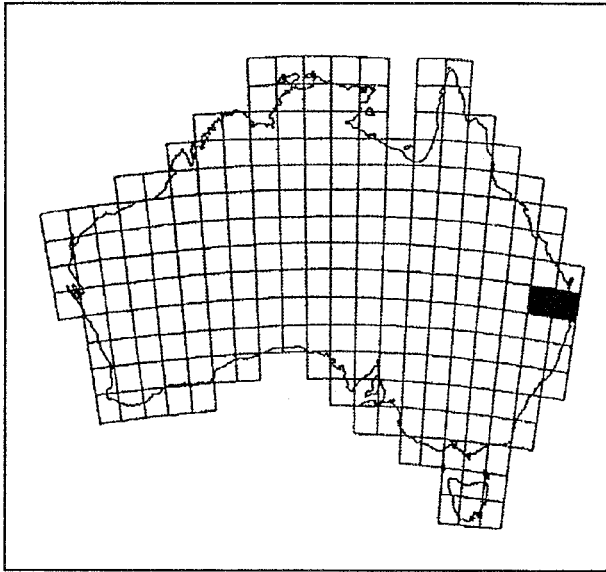
References:

Ehmann, H.F.W. 1992. Encyclopedia of Australian Animals: Reptiles. Australian Museum with Angus and Robertson, Sydney. xv + 495 pp.

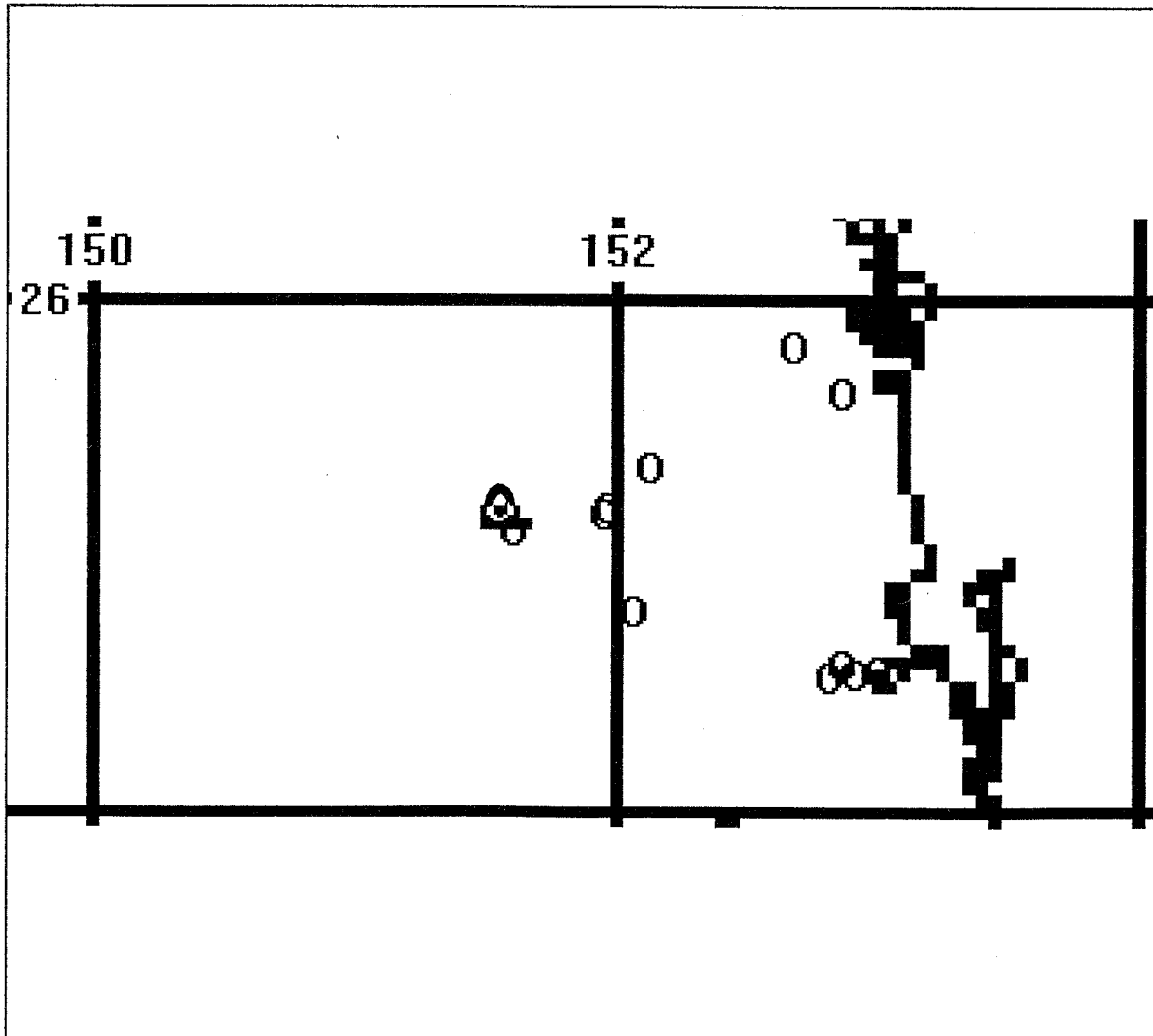
Kluge, A.G. 1974. A taxonomic revision of the lizard family Pygopodidae. Miscellaneous Publications of the Museum of Zoology, University of Michigan 147: i-vi + 1-221.

McDonald, K.R., Covacevich, J.A., Ingram, G.J. and Couper, P.J. 1991. The status of frogs and reptiles. pp. 338-345 in G.J. Ingram and R.J. Raven (eds) An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals. Queensland Museum, Brisbane.

Wilson, S.K. and Knowles, D.G. 1988. Australia's Reptiles; a photographic reference to the terrestrial reptiles of Australia. Collins Publishers, Australia. 447 pp.



Distribution of *Delma torquata*



1. Family:	Pygopodidae
2. Scientific Name:	<i>Ophidiocephalus taeniatus</i> Lucas and Frost, 1897
3. English Name:	Bronzeback Snake-lizard

4. **Intraspecific taxa:** None

5. **Species survival status:** Vulnerable.

6. **Former distribution:** Southern Northern Territory and adjacent regions of South Australia, as far south as Coober Pedy. Original specimen collected in the 1890s from the vicinity of Charlotte Waters, in the far south of the Northern Territory just west of the Simpson Desert, but it has not since been recorded in the Northern Territory. The population at Abminga appears to have undergone a severe decline in the late 1980s (Ehmann, 1992).

7. **Current distribution:** Watercourse country of northern South Australia, from Abminga on the Northern Territory border to Coober Pedy. May extend throughout the drainage basins of the Finke River and the western watershed of Lake Eyre (Ehmann, 1981). Last recorded in 1986, in Breakaways Reserve 25 km north-north-west of Coober Pedy, South Australia (Hutchinson, 1992). There are anecdotal reports of its occurrence in the George Gill Ranges in the Northern Territory (Nick Gambold, *in litt.*).

8. **Habitat:** Open woodland.

Found along temporary watercourses lined by Gidgee (*Acacia cambagei*) open woodland with a low open shrub understorey; microhabitat is deep leaf litter and loose sandy loam soil overlying well-drained deep cracking clays, at the base of trees or chenopod shrubs.

9. **Reasons for decline:** Not known to have declined, but has only been recorded from four scattered localities and it is vulnerable to a number of threats including overgrazing by cattle, grazing by rabbits, soil compaction and erosion, loss of litter, and possibly also severe flooding.

Present patchy distribution may be natural or due to past habitat modification by cattle which compact the soil and disperse litter by trampling;

such damage is obvious only near permanent water and under shade trees. Severe flooding, resulting in the scouring of loose surface layers and elsewhere in the deposition of compacted silt or pebbles over the litter "blanket", may have adversely affected the Abminga population (Ehmann, 1992). However, it "is possible that severe local population fluctuations are a normal part of the ecology of the Bronzeback" (Ehmann, *op. cit.*).

10. **Conservation reserves on which species occurs:** South Australia: Breakaways Reserve.

10A. **Other conservation reserves where species might be expected to occur:** South Australia: Witjira NP.

11. **Other public land on which species occurs:** None known.

12. **Other land on which species occurs:** Grazing leases in the Abminga area and mining leases and township gardens in Coober Pedy; potentially present in suitable habitat on private properties throughout the species' range.

13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.

13.1: Ground surveys need to be conducted to determine the full geographic range of the species and the extent of its occurrence in existing reserves.

13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.

13.3: Research is needed to determine if the species is declining and if so, to identify the major factors contributing to that decline.

14. **Recovery Plan objectives:**

14.1: To obtain sufficient information on the species' biology, ecology and distribution

- to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
- 15. Management actions already initiated:**
- 15.1: Listed on Schedule 1 of the Commonwealth's *Endangered Species Protection Act 1992* and listed as "endangered" on the 1991 Schedule of the *SA National Parks and Wildlife Act 1972*.
- 16. Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves or extend boundaries of Witjira NP if the existing reserve system is found to be inadequate

- to secure the survival of the species.
- 16.4: Develop guidelines and provide incentives to landowners to protect the habitat of a suite of vertebrates (including *Ophidiocephalus taeniatus*) outside reserves. Adopt a species with a higher profile eg a mammal, to promote the guidelines (Dave Gibson, *in litt.*).
- 16.5: Develop community awareness within the species' known range.
- 16.6: Implement control program for rabbits if they are demonstrated to have an adverse effect on the species through destruction of habitat.

17. Organisations responsible for conservation of species and individuals involved: Conservation Commission of the Northern Territory, South Australian Department of Environment and Land Management.

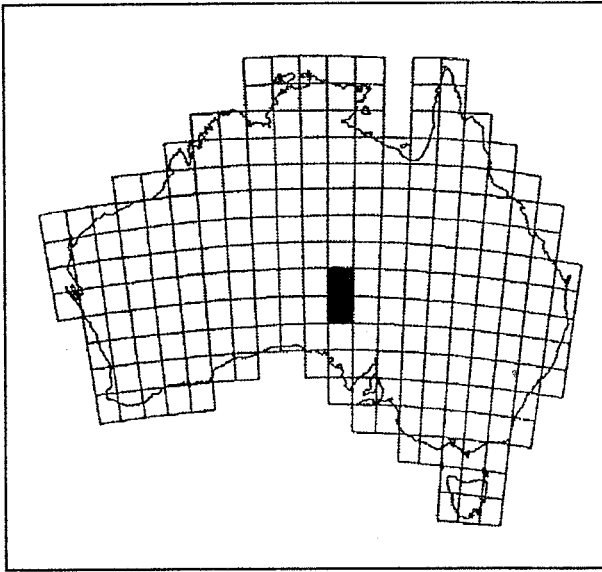
18. Other organisations and individuals involved: Harald Ehmann (Sydney Institute of Technology).

19. Can recovery plan be carried out with existing resources?:	No.
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$20,000 expenses (1.5 x standard expenses for remote region). \$46.667K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 2 years - \$26,667 salary; \$20,000 expenses (1.5 x standard expenses for remote region). \$46.667k
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses. \$12K
4:	Purchase of land for the reserve system: uncosted.
	Total \$105.3K

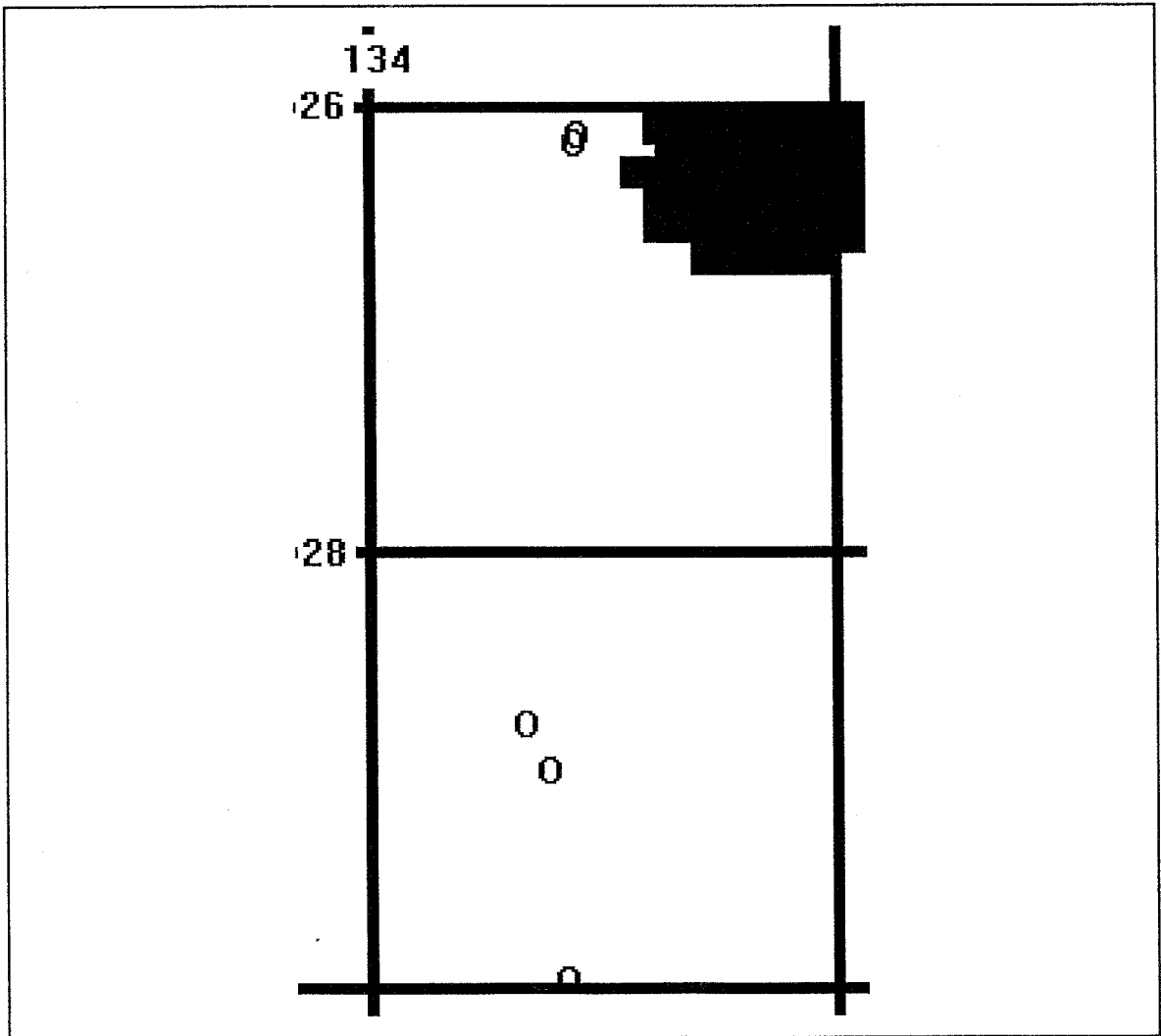
20. Remarks: 14 specimens documented in Australian museum collections. Field observations made on over 50 individuals in the Abminga region in the late 1970s by Harald Ehmann and colleagues.

References:

- Ehmann, H.F.W. 1981. The natural history and conservation of the bronzeback (*Ophidiocephalus taeniatus* Lucas and Frost) (Lacertilia, Pygopodidae). pp.7-13 in C.B. Banks and A.A. Martin (eds) Proceedings of the Melbourne Herpetological Symposium, 1980. Zoological Board of Victoria, Melbourne.
- Ehmann, H.F.W. 1992. The apparent severe decline of the bronzeback legless lizard (*Ophidiocephalus taeniatus*) at Abminga. *Herpetofauna* 22(1): 31-33.
- Hutchinson, M.N. 1992. Threatened reptiles in South Australia. Section 7 in S.P. Tay (ed.) Threatened species and habitats in South Australia: a catalyst for community action. South Australian Advisory Committee on Threatened Species, Adelaide.



Distribution of
Ophidiocephalus taeniatus



1. **Family:** Pygopodidae
2. **Scientific Name:** *Paradelma orientalis* (Günther, 1876)
3. **English Name:** Brigalow Scaly-foot

4. **Intraspecific taxa:** None
5. **Species survival status:** Vulnerable.
6. **Former distribution:** Not known to have differed from current distribution.
7. **Current distribution:** The Brigalow Belt east of the Great Dividing Range in south-central Queensland. There is a concentration of museum specimens from the Moura and Cracow areas and it occurs at some localities (including Boyne Island) on the east coast near Gladstone.
8. **Habitat:** Open forest, woodland.
- Found in remnant Brigalow (*Acacia harpophylla*) forest or eucalypt woodland with an understorey of Brigalow and sparse tussock grass ground cover, on grey cracking clay soils. Also found on sandstone ridges (Wilson and Knowles, 1988) and in *Acacia falciformis* woodland with a deep leaf litter layer, on Boyne Island (Peter Tremul, pers. comm.).
9. **Reasons for decline:** Probably a combination of factors including overgrazing by cattle, clearance of habitat for agriculture and cattle grazing, pasture improvement, crop production and native forest logging.
- Much of the Brigalow Belt has been cleared for agriculture and pastoralism and only about 0.5% is conserved in reserves (McDonald *et al.*, 1991).
10. **Conservation reserves on which species occurs:** Queensland: Carnarvon NP (as Salvator Rosa NP).
- 10A. **Other conservation reserves where species might be expected to occur:** Castle Tower NP, Deepwater NP, Expedition Range NP (including the former Robinson's Gorge NP), Eurimbula NP, Isla Gorge NP, Nuga Nuga NP, Palm Grove NP, Precipice NP, Rundle Range NP.
11. **Other public land on which species occurs:** Coomingleh SF (near the Rockhole), Dunmore SF, roadside reserve near Moura, Lily Hills Crown Land Reserve (Boyne Island).
12. **Other land on which species occurs:** Queensland: Wandoo Station near Moura, Kolonia Station near Wandoan, Golden Plateau via Cracow, Nathan Gorge between Cracow and Taroom; potentially present in suitable habitat on private properties throughout the species' range.
13. **Is knowledge about species adequate for objectives and actions to be defined accurately?:** No.
- 13.1: Ground surveys need to be conducted to determine the full geographic range of the species, its habitat preferences, and the extent of its occurrence in existing reserves.
- 13.2: Research is needed into the basic biology and ecology of the species in the field; it should include long term monitoring of changes in population size, habitat use and geographic range.
- 13.3: Research is needed to document the extent of the species' decline and to identify the major factors contributing to that decline.
14. **Recovery Plan objectives:**
- 14.1: To obtain sufficient information on the species' biology, ecology and distribution to determine its current conservation status and formulate appropriate management strategies.
- 14.2: To ensure that secure, viable populations of the species are maintained within a reserve system.
- 14.3: To implement land management practices which promote the maintenance of secure, viable populations of the species outside reserves.
15. **Management actions already initiated:** None known.

- 16. Management actions required:**
- 16.1: Survey known and potential habitat in reserves within the species' known range.
- 16.2: Survey known habitat outside reserves within the species' known range.
- 16.3: Establish appropriate reserves if the existing reserve system is found to be inadequate to secure the survival of the species.
- 16.4: Develop and promote guidelines and provide incentives for landowners and users to reduce the impact of current land use practices on the species outside reserves.
- 16.5: Develop community awareness within the species' known range.

16.6: If *Acacia* shrubland characteristic of regeneration is demonstrated to be a significant habitat, develop a fire regime which maintains such habitat.

17. Organisations responsible for conservation of species and individuals involved: Queensland Department of Environment and Heritage.

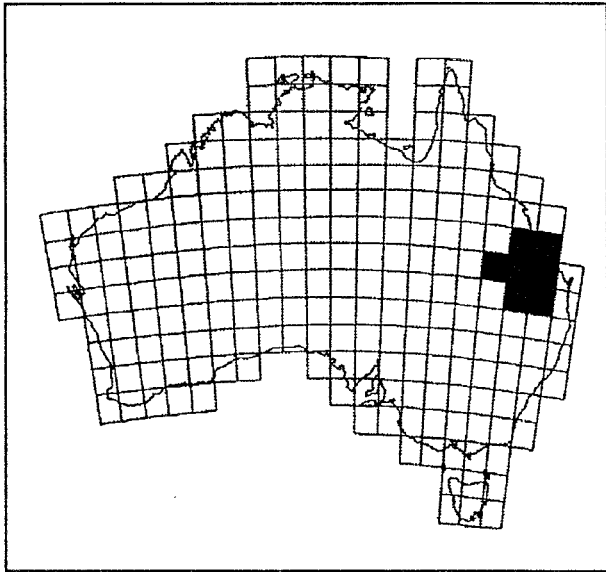
18. Other organisations and individuals involved: Peter Robertson (Arthur Rylah Institute), Peter Tremul (Boyne Island), Steve Wilson (Queensland Museum).

19.	Can recovery plan be carried out with existing resources?: No.	
1:	Survey of geographic range, habitat preferences and occurrence in reserves: 2 workers for 2 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
2:	Research into basic biology and ecology, including assessment of threatening processes: 1 worker for 4 months each year for 2 years - \$26,667 salary; \$13,333 expenses.	\$40K
3:	Preparation of management strategies: 1 worker for 3 months - \$10,000 salary; \$2,000 expenses.	\$12K
		Total \$92K

20. Remarks: 18 specimens documented in Australian museum collections. This species has some unusual patterns of behaviour for a pygopodid: plant exudates appear to be an important component of its diet - it has been regularly observed licking sap from *Acacia* trunks (Peter Tremul, pers. comm.), it is almost exclusively nocturnal, and it is very slow-moving (Shea, 1987).

References:

- McDonald, K.R., Covacevich, J.A., Ingram, G.J. and Couper, P.J. 1991. The status of frogs and reptiles. pp. 338-345 in G.J. Ingram and R.J. Raven (eds) *An Atlas of Queensland's Frogs, Reptiles, Birds and Mammals*. Queensland Museum, Brisbane.
- Robertson, P. and Tremul, P. in prep. Feeding behaviour of *Paradelma orientalis*. For submission to Herpetofauna.
- Shea, G. M. (1987). Notes on the biology of *Paradelma orientalis*. Herpetofauna 17(1): 5-6.
- Wilson, S.K. and Knowles, D.G. 1988. *Australia's Reptiles; a photographic reference to the terrestrial reptiles of Australia*. Collins Publishers, Australia. 447 pp.



Distribution of *Paradelma orientalis*

